CR

(*Reprinted from Nature, Vol. 219, No. 5154, pp. 576–577, August 10, 1968*)

New Pulsating Radio Source

Harvard radio astronomers have discovered a new pulsating radio source with a pulse repetition period of 0·73968 ± 0·00002 s

by

G. R. HUGUENIN, J. H. TAYLOR, L. E. GOAD, A. HARTAI, G. S. F. ORSTEN

and

A. K. RODMAN

Harvard College Observatory, Cambridge, Massachusetts

A NEW pulsating radio source has been discovered during the first phase of a systematic search for such objects carried out with the 300 foot transit telescope at the US National Radio Astronomy Observatory (NRAO). The new source lies at the position $\alpha(1950) = 15^h\ 06^m \pm 2^m$, $\delta(1950) = +55°\ 30' \pm 40'$, has a heliocentric pulse-repetition period of 0·73968 ± 0·00002 s, and is similar in many respects to the four pulsars discovered earlier this year by Hewish *et al.*[1] and Pilkington *et al.*[2]. We suggest that the source be called *HP* 1506, for Harvard pulsating source at right ascension $15^h\ 06^m$, to conform with the nomenclature used for the Cambridge pulsars.

The survey was carried out at a frequency of 110 MHz during the period June 15 to July 11, 1968. The 300 foot antenna was driven back and forth in declination at a rate of 2·5 arc degrees min^{-1}, so as to trace out a zigzag pattern across the sky. The widths of the declination strips scanned were chosen so that the adjacent end points of the zigzag were separated by approximately one half-power beamwidth, or 2°. Thus, for example, the entire declination strip +45° to +60° could be observed in one day; any given location inside this strip was within the main beam of the antenna for approximately one minute each day.

The survey receiver had a bandwidth of 0·3 MHz, and its output was sampled and recorded on magnetic tape once every 10 ms. A search for periodic signals in the receiver output was made with a digital computer. The search programme was most sensitive to periods in the range 0·16 to 2·5 s, although strong signals with periods an octave or so outside this range would also have been detected. Less than 10 per cent of the data taken during the survey have so far been analysed.

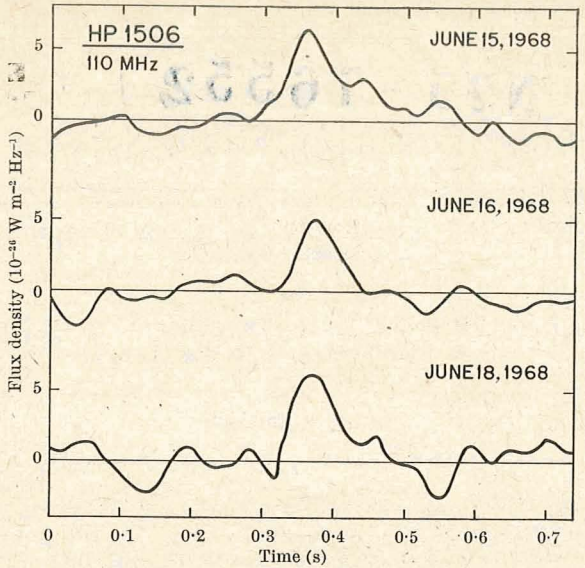

Fig. 1. Average pulses observed from *HP* 1506 on June 15, 16 and 18, 1968. The pulses are broadened by the effects of receiver bandwidth and time constant.

Signals from *HP* 1506 were found in the computer analysis of the first day's data, and again in the data recorded on June 16 and 18. Fig. 1 is a plot of the average pulses recorded on these three days. Each curve was obtained by cross-correlating approximately 40 s of data with a train of uniform pulses spaced by 0·7397 s, a figure very close to the correct pulse repetition period. The average pulses shown in Fig. 1 are broadened considerably by the effects of receiver bandwidth and time constant, and do not represent the intrinsic pulse width or shape.

More detailed observations of the source were made later with six receivers operating simultaneously, each having a bandwidth of 0·1 MHz and an effective integration time of 1·6 ms. The six receivers were tuned in pairs to three different frequencies in the range 110 to 116 MHz, and the pairs were connected to orthogonally polarized feed antennae. Preliminary results from these data show (*a*) that the pulses from *HP* 1506 are intrinsically about 20 ms in width; (*b*) that the signals have considerable linear polarization; and (*c*) that the frequency drift rate, presumably due to dispersion in the interstellar medium, is $-8{\cdot}0 \pm 0{\cdot}2$ MHz s^{-1} at 110 MHz. The latter figure corresponds to an integrated electron density along the path of propagation of $\int N_e \, dl = 20{\cdot}0 \pm 0{\cdot}5$ cm^{-3} pc. This value is greater than the corresponding values found for the four Cambridge pulsars, and may be indicative of a greater distance.

The intensity of the pulses from *HP* 1506 is comparable with those from *CP* 0834 and *CP* 1133, which are the weaker of the four Cambridge pulsars at frequencies near 100 MHz. The strongest pulses we have recorded from *HP* 1506 have an energy of about 15×10^{-26} J m^{-2} Hz^{-1} at 110 MHz, and an average pulse has an energy smaller by approximately a factor of 30.

After the first observations with the 300 foot transit telescope, an improved period and position were obtained by observing the source for several hours at a time with the NRAO 140 foot telescope. The latter observations were made at frequencies of 111, 234, 256, 405 and 610 MHz during the period July 11 to July 15. The pulse dispersion derived from observations near 110 MHz was substantiated by the observations at higher frequencies.

This work was supported by the US National Science Foundation and by the US National Aeronautics and Space Administration. We are grateful for the use of the facilities at the US National Radio Astronomy Observatory.

Received July 22, 1968.

[1] Hewish, A., Bell, S. J., Pilkington, J. D. H., Scott, P. F., and Collins, R. A., *Nature*, **217**, 709 (1968).
[2] Pilkington, J. D. H., Hewish, A., Bell, S. J., and Cole, T. W., *Nature*, **218**, 126 (1968).

Printed in Great Britain by Fisher, Knight & Co., Ltd., St. Albans.